



IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF:

Takanori ISOZAKI

: GROUP ART UNIT: 1713

SERIAL NO: 09/845,271

: EXAMINER: Judy M. Reddick

FILED: May 1, 2001

FOR: Polyvinyl Alcohol Polymer Film

DECLARATION UNDER 37 C.F.R. § 1.132

Honorable Commissioner of Patents and Trademarks,  
Washington, D.C. 20231

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GROUP 170

Sir:

I, Takanori Isozaki, residing at 3557-20, Ibara-cho, Ibara-city, Okayama Prefecture, Japan do hereby declare as follows:

I have graduated Okayama University, School of Science, Master Course in March, 1991; and from April, 1991 up to date I have been an employee of Kuraray Co., Ltd. and have been mainly engaged in the field of development of polyvinyl alcohol (hereinafter referred to as PVA) and application thereof to polarizing films.

I am an inventor in the above-identified application and am familiar with the instant technical field.

I declare that the results of experiment I have conducted are as follows and that they are true to the best of my knowledge and belief.

In order to show that the polyvinyl alcohol film defined in the claims of the above-identified application is patentably distinct from those taught or suggested in JP5337967, comparative test has been carried out under my supervision as follows.

Experiment 1

The physical properties of the film in the Experiment were measured according the methods mentioned below.

(1) Water content:

Using the infrared vacuum dryer (made from Sato Vacuum), 2g of film was dried at 50 °C and 2 Torr for 2 hours, and computed by the following formula.

Water content =  $100 \times (\text{weight of the film before drying} - \text{weight of the film after drying}) / \text{weight of the film before drying}$

A condition in such plasticizers such as a glycerol contained in the film do

not evaporate, is taken in the measurement.

(2) Average thickness and thickness unevenness:

Samples of 5 points at regular intervals in width direction and of 10 points at 1m regular intervals in the length direction are taken. Using the contact-type film thickness continuous measuring instrument (made from Anritsu Electric), and applying a measuring load of 30g at the end of the detection made of a diamond sphere with a diameter of 3mm, the thickness of a film was measured at a taking speed of 1.5m/min. The average thickness of the film was calculated on the average of the measured value of the samples of 10 points, and the thickness unevenness of the film was calculated from the difference of the maximum of the measured value of the samples of 10 points and the minimum of the measured value of the samples of 10 points.

(3) Rate of average birefringence and unevenness of birefringence:

Samples of 20 points in the length direction of a film in 5cm pitch are taken. Using the retardation measuring instrument (KOBRA-21 by Kanzaki Paper Mfg. Co., Ltd. (tradename)), a retardation was measured, and the thickness of a film in the same place was measured using a micrometer. The rate of birefringence of the film was calculated by dividing the measured value of the retardation by the measured value of film thickness. The rate of average birefringence was calculated on the average of the measured value of the samples of 20 points, and the unevenness of birefringence was calculated from the difference of the maximum of the measured value of the samples of 20 points and the minimum of the measured value of the samples of 20 points.

(4) Maximum draw ratio:

PVA film with 15cm width was stretched in an aqueous solution having a boric acid concentration of 4% by weight at 35 °C at a extension speed of 0.26 m/min. The greatest draw ratio when the film can be stretched without breaking, is the maximum draw ratio.

(5) Polarization unevenness:

The polarization film was manufactured by the methods mentioned below using the PVA film obtained by the examples and the comparative example. As a dye stuff concentration in a dyeing bath, the weight ratio of iodine to potassium iodide was adjusted to 1/10, and the iodine concentration was selected within a range of 1-20g/liter so that single transmittance was 43%. The concentration of boric acid in a bath of boric acid was 4% by weight, and boric acid was also added to the bath for stretching so that the concentration of the boric acid in the bath was 4% by weight. The film was stretched at the maximum draw ratio shown in Table 1. The film after stretching was dried in hot air at 50 °C. Polarization unevenness of the obtained polarization film was evaluated through visual observation.

100 parts by weight of PVA (degree of polymerization 1750, and degree of hydrolysis 99.9 mol%), 12 parts by weight of glycerol and water as a solvent were added to obtain the homogeneous solution with the water content of 60% by weight (wet basis, the same is applied hereinafter). The fixed quantity of the solution was fed to the die, the film with 75  $\mu\text{m}$  in thickness and a width of 1m was manufactured using the belt-type film production machine, and it was heat-treated with the heat setting machine. The main manufacture conditions are shown below.

Die:

T type slit die

Die temperature 100  $^{\circ}\text{C}$

Film production machine:

The belt made from stainless steel

Length 20 m

Belt speed 10 m/min.

Dry conditions

Initial temperature of drying 100  $^{\circ}\text{C}$

Latter temperature of drying 150  $^{\circ}\text{C}$

Drying time 120 second

Water content of the film at the stripping stage 9.0% by weight

Heat setting machine :

Hot air type

Hot air temperature 160  $^{\circ}\text{C}$

Treating time 15 seconds

Water content of the film outlet 1.5 % by weight

Water content of the film after conditioning 6.0 % by weight

The physical properties of the PVA film obtained are shown below.

Average thickness 75.1  $\mu\text{m}$

Thickness unevenness 1.5  $\mu\text{m}$

Rate of average birefringence [ $\Delta n (\times 10^3)$ ] 0.40

Unevenness of birefringence [ $R(\Delta n)(\times 10^3)$ ] 0.09

Maximum draw ratio 5.2 times

Polarization unevenness none

The thickness unevenness, the rate of average birefringence and the unevenness of birefringence of the PVA film had are small, and the stretchability of the PVA film was good.

The maximum value of difference in retardation between two points separated by 1cm of this PVA film was 3nm. When a PVA film was continuously produced according to the aforementioned conditions, a wrinkle occurred in a PVA

film every about 2000m of length. The value of difference in retardation between two points separated by 1cm of the PVA film where the wrinkle occurred was 10nm. The recurrent wrinkle occurred in the PVA film was caused by the lowered adhesiveness of PVA film with the belt made from stainless steel due to low water content of the PVA film at the stripping stage (9.0% by weight).

The above-mentioned PVA film was subjected to the same treatment as in Example 1 of the present U. S. application. Namely, the PVA film was subjected to preliminary swelling, dyeing, monoaxial stretching, fixing treatment, drying and heat treatment in this order, to produce a polarization film. The PVA film was immersed in water of 30 °C for 5 minutes to effect preliminary swelling, and immersed in an aqueous solution of 35 °C having an iodine concentration of 0.4 g/liter and a potassium iodide concentration of 40 g/liter for 3 minutes. Subsequently, monoaxial stretching was conducted at 5.5 times in an aqueous solution of 40 °C having a boric acid concentration of 4%, then the stretched film was immersed in an aqueous solution of 30 °C having a potassium iodide concentration of 40 g/liter, a boric acid concentration of 40 g/liter and a zinc chloride concentration of 10 g/liter for 5 minutes to effect fixing treatment. After that, the PVA film was removed, and dried with hot air of 40 °C and further, heat-treated at 100 °C for 5 minutes, while maintaining the length constant. The resulted polarization film carried a color irregularities due to dyeing irregularities where the wrinkle occurred, and it was considered to be inappropriate as final product.

I, the undersigned declarant, declare further that all statement made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and; further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001, of Title 18, of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed this 16th day of April, 2003

Name: *Takanori Isozaki*  
Takanori Isozaki